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The certification body of the Ada certification system consists of the AJPO for overall direction, the Ada Validation Organization (AVO) and ACVC Maintenance Organization (AMO) for technical support, and the Ada Validation Facilities (AVFs) for performing validations. The Ada certification body operates in conjunction with the U.S. Department of Commerce, which has the responsibility of establishing and maintaining a certification system for the Federal Information Programming Standards (FIPS). The purpose of this executive summary is to provide only an overview of the Ada compiler validation process. Anyone who obtains services from the Ada certification body must understand the definition of terms and follow the more specific rules provided in the body of this document.

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Ada Compiler Validation Procedures

Version 3.1

August 1992

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**Ada Joint Program Office
Room 3E114
The Pentagon
Washington, D.C. 20301-3081**

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EXECUTIVE SUMMARY

The purpose of this executive summary is to provide only an overview of the Ada compiler validation process. Anyone who obtains services from the Ada certification body must understand the definition of terms and follow the more specific rules provided in the body of this document.

- **Organization and Responsibilities**

The Ada certification body consists of the Ada Joint Program Office, (AJPO), the Ada Validation Organization (AVO), the ACVC Maintenance Organization (AMO), and the Ada Validation Facilities (AVFs). The AJPO, a component of the Department of Defense, establishes the policies of the Ada certification system, issues validation certificates for AVF-tested Ada implementations and registers Ada implementations that are un-tested by an AVF. The AVO provides the technical and administrative support required to operate the Ada certification system. The AMO provides the technical and administrative support required to supply the Ada Compiler Validation Capability (ACVC) for use in the operation of the Ada certification system. There are five AVFs chartered by the AJPO to conduct validation (see Appendix G for points of contact). The Ada certification body works with the U.S. Department of Commerce which has the responsibility for establishing and maintaining a certification system for the Federal Information Processing Standards (FIPS).

- **The Ada Compiler Validation Capability**

The ACVC is designed to demonstrate the compliance of an Ada implementation with the Ada Programming Language. Each new version of the ACVC test suite is available for at least six months before it is used for validation. The final ACVC version for Ada83 is version 1.11. Version 1.11 will be used for validation until after the Ada9X ACVC is available. The AJPO will determine the expiration date of ACVC 1.11 after Ada 9X has been adopted by ANSI. The AJPO will announce the expiration date at least six months in advance.

Some test programs may contain test objectives which are irrelevant for a particular Ada implementation and may be declared inapplicable, in whole or in parts, for that

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implementation. The grading criteria for each test and the ACVC User's Guide, distributed with the ACVC, provide information about the applicability of test programs. Some test programs are designed to make use of implementation dependent characteristics and must be adjusted according to instructions given in the ACVC User's Guide. Tests may be withdrawn from the ACVC by the AVO when it is found that they are based on assumptions that need not hold true for all Ada implementations or that the test program does not meet its test objective. Any interested party may dispute a test program to the Ada Rapporteur Group, ISO WG9. An AVF Customer must dispute a test program only through an AVF. (See Sections 4.4, 5.2.3, 5.2.4 and Appendix B and C). The AVF customizes an ACVC for each Ada implementation which is validated by testing. An Ada implementation passes a given ACVC version if it processes each test of the customized ACVC and no test is failed; otherwise, the Ada implementation fails the ACVC. The ACVC is available to the public from the National Technical Information Service (NTIS) according to Department of Commerce policies and rules for the payment of fees and for export control. The ACVC is also available to customers of an AVF.

• Validation by Testing

There are well defined steps which must be completed by a customer and the Ada certification body so that the customer obtains a validation certificate and a Validation Summary Report (VSR). These steps are:

- a. A formal validation agreement between the customer and an AVF is required to obtain validation services (see Section 5.1).
- b. Prevalidation which consists of customer testing, submission of results to the AVF, and the resolution of test issues (see Section 5.2).
- c. Validation testing performed by an AVF at a mutually agreed upon site (see Section 5.3).
- d. A Declaration of Conformance is completed and signed by the customer not later than at validation testing. A validation certificate will not be issued until a Declaration of Conformance has been completed (see Section 5.4 and Appendix A).
- e. A VSR is prepared by the AVF to document the validation by testing (see Section 5.5).
- f. A Validation Certificate is issued by authority of the AJPO for a successfully tested Ada implementation (see Section 5.6).

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g. An Ada implementation that fails one to ten ACVC test programs may be provisionally validated for a 12-month period. During this year, the Ada implementation must be re-tested by the AVF and successfully pass the ACVC to obtain a validation certificate. (See Section 5.7.)

- Validation by Registration

An Ada implementation may be derived from one which has been validated by testing (a base implementation) when four conditions are true (see Section 6.2). These conditions provide an easy test for determining whether to proceed with a request to register an Ada implementation which was derived from a base implementation. A registration request must be submitted to the AVO in the form provided in Appendix D. The AVO will review registration requests for completeness and plausibility of information. A registration request which is accepted by the AVO will be forwarded to the AJPO to be added to the public list of Ada implementations validated by registration. A derived implementation loses its status of being validated if it is challenged successfully (see Section 6.7), upon expiration of the validation certificate of its base implementation, or when registration is revoked by the customer. A procedure is provided for adjudication of a claim that the derived implementation fails the ACVC used to validate the base implementation (See Section 6.7-6.9).

Three appendices have been added to this document. Appendix C provides a description of the Test Dispute and Resolution Process. Appendix D provides a standard form that will be used for submitting a registration request. Appendix F provides Project Guidelines for the use of baselined Ada compilers. These guidelines are normative for the DoD (United States) and optional for others.

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1. INTRODUCTION

The United States Department of Defense (DoD) sponsored the development of the **Ada programming language** and established the **Ada Joint Program Office (AJPO)** as part of an effort to support recognized principles of software engineering for a wide range of applications. In view of the well known benefits of standardization, the **AJPO** has established a **certification system** to prevent the proliferation of dialects of the **Ada programming language** and to encourage **Ada implementations** which conform to the [ANSI 83]. The **Ada certification system** rules of procedure and management address the **validation** of **Ada implementations** by testing and by registration. This document provides an operational definition of a **validated Ada compiler** which is required by [DoD 91] and by the [FIRMR 87]. This version [3.1] pertains to the current **validation process** of **Ada implementation** as defined by [ANSI 83], as well as its successor, informally known as **Ada 9X**. Subsequent revisions will reflect the **Ada 9X transition policy** and procedures for use of the **Ada 9X ACVC**.

The principals of the **certification body** of the **Ada certification system** consist of the **AJPO** for overall direction, the **Ada Validation Organization (AVO)** and **ACVC Maintenance Organization (AMO)** for technical support, and the **Ada Validation Facilities (AVFs)** for performing validations. The **Ada certification body** operates in conjunction with the U.S. Department of Commerce which has the responsibility for establishing and maintaining a **certification system** for the **Federal Information Programming Standards (FIPS)**.

It is important to note the scope and intent of **Ada validation**. Users of an **Ada implementation** are cautioned that the purpose of **validation** is to encourage **conformity** of **Ada implementations** with the standard and that characteristics other than those specified by the standard, such as performance or suitability for a particular application, are outside the scope of **Ada validation**. Moreover, users are cautioned that the yardstick of **conformity testing** is the collection of test programs contained in the **ACVC**. Thus, **conformity** is measured only within the limitation of these tests.

A glossary of terms used in this document is provided in Section 2. Terms defined in the glossary are signified in the text of the document by bold print. Appendices to this document provide examples of documents used in **validation**, a description of the test dispute and resolution process, project guidelines for use of **baselined Ada compilers**, current points of contacts, and references.

2. GLOSSARY OF TERMS

Ada PROGRAMMING LANGUAGE: The language defined by reference [ANSI 83] or its successors.

ACVC MAINTENANCE ORGANIZATION (AMO): The part of the certification body that maintains the ACVC.

ACVC Reviewers: A part of the certification body which provides technical expertise for ACVC development.

ACVC TEAM: The group that produces the ACVC under contract to the AMO.

ACVC USER'S GUIDE: A document that explains the technical details of processing the test programs and evaluating their results.

Ada COMPILER: The software and any needed hardware that have to be added to a given host and target machine to allow transformation of Ada programs into executable form and execution thereof.

Ada COMPILER VALIDATION CAPABILITY (ACVC): The means for testing compliance of Ada implementations, consisting of the test suite, the support programs, the ACVC user's guide and the template for the validation summary report.

Ada IMPLEMENTATION: An Ada compiler with its host machine and its target machine.

Ada JOINT PROGRAM OFFICE (AJPO): The part of the certification body that provides policy and guidance for the Ada certification system.

Ada Rapporteur Group (ARG): The Ada Rapporteur Group (ARG) is a subgroup of ISO-IEC/JTC1/SC22/WG9, the International Standards Organization Working Group for Ada. Members of the ARG are appointed by the convener of the ISO working group for the purpose of resolving issues with respect to the interpretation of the Ada programming language.

Ada VALIDATION FACILITY (AVF): The part of the certification body that carries out the procedures required to establish the compliance of an Ada implementation.

Ada VALIDATION ORGANIZATION (AVO): The part of the certification body that provides technical guidance for operations of the Ada certification system.

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ADAPTIVE MAINTENANCE: [ANSI/IEEE 90] Maintenance performed to make a software product usable in a changed environment.

APPLICABLE ACVC TEST: A test that is neither inapplicable nor withdrawn. Compare with inapplicable test program and withdrawn test program.

BASE IMPLEMENTATION: An Ada implementation that was validated by testing (see Section 5).

BASELINE: [IEEE 90] A specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further software development or maintenance work, that can be changed only through formal change procedures. (See Appendix F).

CERTIFICATION BODY: [ISO/IEC 86] An impartial body, governmental or non-governmental, possessing the necessary competence and reliability to operate a certification system, and in which the interests of all parties concerned with the functioning of the system are represented.

CERTIFICATION MARK: A mark which may be used only on products directly associated with the Ada compiler for which the certification mark was awarded.

CERTIFICATION SYSTEM: [ISO/IEC 86] A system having its own rules of procedure and management for carrying out conformity certifications.

COMPLIANCE of an Ada IMPLEMENTATION: The ability of the implementation to pass an ACVC version. [Note: For the purposes of this document, compliance is a practical measure of conformity.]

COMPUTER SYSTEM: [IEEE 90] A system containing one or more computers and associated software.

CONFIGURATION MANAGEMENT: [IEEE 90] A discipline applying technical and administrative direction and surveillance to: identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, record and report change processing and implementation status, and verify compliance with specific requirements. (See Appendix F).

CONFORMITY: [ISO/IEC 86] Fulfillment by a product, process or service of all requirements specified. [Note: Also see Section 1.1.2 in the ANSI/MIL-STD-1815A]

CONFORMITY TESTING: The process described in Section 5 of this document.

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CORRECTIVE MAINTENANCE: [ANSI/IEEE 90] Maintenance performed specifically to overcome existing faults.

CUSTOMER: An individual or corporate entity who enters into an agreement with an AVF that specifies the terms and conditions for AVF services (of any kind) to be performed.

CUSTOMIZED TEST SUITE: The ACVC tests, adjusted as necessary, that must be used for a given Ada implementation (see Section 4.5).

DECLARATION of CONFORMANCE: A formal statement from a customer assuring that conformity is realized or attainable on the Ada implementation for which validation status is requested. [see Appendix A for the format of a declaration of conformance.]

DERIVED IMPLEMENTATION: An Ada implementation that was obtained from a base implementation that has a current validation certificate (see Section 6).

FAIL AN ACVC VERSION: The Ada implementation fails one or more test of the customized test suite.

FAST REACTION TEAM (FRT): The part of the certification body that provides expertise for the expeditious resolution of test issues. (See Appendix C).

HOST MACHINE: [IEEE90] (1) A computer used to develop software intended for another computer. (contrast with **Target Machine**(1)) (2) A computer used to emulate another computer. (3) The computer on which a program or file is installed. (4) In a computer network, a computer that provides processing capabilities to users of the network.

INAPPLICABLE TEST: A test that contains one or more test objectives found to be irrelevant for the given Ada implementation.

INSTRUCTION SET: [IEEE90] The complete set of instructions recognized by a given computer or provided by a given programming language.

KERNEL: [IEEE90] (1) That portion of an operating system that is kept in main memory at all times. (2) A software module that encapsulates an elementary function or functions of a system.

OPERATING SYSTEM: [IEEE90] A collection of software, firmware, and hardware elements that controls the execution of computer programs and provides such services

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as computer resource allocation, job control, input/output control, and file management in a computer system.

PASS AN ACVC VERSION: No test of the customized test suite is failed.

PERFECTIVE MAINTENANCE: [ANSI/IEEE 90] Maintenance performed to improve performance or maintainability.

PREVALIDATION TESTING: Processing of an appropriately customized test suite by the customer.

PROJECT COMPILER: A validated Ada compiler that is baselined for a project in accordance with applicable configuration management practices. A project compiler may be used for the life of the project (see Appendix F).

PROVISIONAL VALIDATION CERTIFICATE (PVC): Issued by authority of the AJPO for tested Ada implementations that fails an ACVC version. (See Section 5.7.)

REGISTRATION REQUEST: A formal request for extension of validated status to a derived implementation. (See Appendix D for the required form).

RESULT PROFILE: The result of processing the customized test suite according to given evaluation criteria (see Section 6).

SOFTWARE MAINTENANCE: [ANSI/IEEE 83] Modification of a software product after delivery to correct faults, to improve performance, or to adapt the product to a changed environment.

TARGET MACHINE: [IEEE90] (1) The computer on which a program is intended to run.
(2) A computer being emulated by another computer.

TARGET RUN-TIME SYSTEM: The set of sub-programs that may be invoked by linking, loading, and executing object code generated by an Ada compiler. If these sub-programs use or depend upon the services of an operating system, then the target run-time system includes those portions of that operating system.

TEST ISSUE: Any problem arising during validation (see Section 5.2.3).

VALIDATION: The process of checking the conformity of an Ada compiler to the Ada programming language and of issuing a certificate for the implementation.

VALIDATED Ada IMPLEMENTATION: An Ada implementation that has been validated successfully either by AVF testing (see Section 5) or by registration (see Section 6).

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VALIDATED Ada COMPILER: The compiler of a **validated Ada implementation**.

VALIDATION CERTIFICATE (VC): Issued by authority of the **AJPO** for tested Ada implementations that pass an **ACVC** version.

VALIDATION SUMMARY REPORT (VSR): A report produced by an **AVF** containing results that are observed from testing a specific **Ada implementation** or grouping of **Ada implementations**.

WITHDRAWN TEST: A test found to be incorrect and not used in **conformity testing**. A test may be incorrect because it has an invalid test objective, fails to meet its test objective, or contains erroneous or illegal use of the **Ada programming language**.

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3. ORGANIZATION AND RESPONSIBILITIES

This section specifies the role of organizations which form the **certification body**, of **customers** who receive service from them, and of project managers who use **Ada implementations** to develop or maintain software.

3.1 Ada Joint Program Office (AJPO)

The **AJPO** establishes the policies of the **certification system** by:

- a. setting validation standards to be followed by all **AVFs**;
- b. establishing the conditions for issuance, the life, and the scope of a **validation certificate**;
- c. establishing the schedule for issuing versions of the **ACVC**;
- d. approving the release of an **ACVC** version;
- e. designating members of the **certification body**;
- f. resolving issues that may arise during **validation** when these issues can not be resolved through the best efforts of the **AVO** and **AVF**;
- g. maintaining the official lists of validated **Ada implementations**; and
- h. issuing documents pertaining to **validation**.

3.2 The Ada Validation Organization (AVO)

The **AVO** provides the technical and administrative support required to operate the **certification system** by:

- a. advising the **AJPO** and **AVFs** concerning requirements for modification to the **validation procedures**;
- b. resolving issues that may arise during the **validation process**;
- c. reviewing all **Validation Summary Reports (VSRs)** prepared by **AVFs**;
- d. recommending to the **AJPO** issuance of a **validation certificate** for **Ada implementations** validated by testing (see Section 5) and the registration of **derived implementations** (see Section 6);

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- e. participating in the ACVC quality control and configuration management process;
- f. deciding on the withdrawal of test programs from the ACVC version that is being used for validation; and
- g. convening meetings of the members of the certification body at appropriate intervals to discuss the validation process and to evaluate practices.

3.3 The ACVC Maintenance Organization (AMO)

The AMO and its ACVC Team provide the technical and administrative support required to supply the ACVC for use in the operation of the certification system by:

- a. producing an ACVC version according to a schedule established by the AJPO;
- b. performing ACVC quality control and configuration management;
- c. distributing an ACVC version to AVFs and the AVO;
- d. distributing an ACVC version to the U.S. National Technical Information Service (NTIS), a service of the U.S. Department of Commerce, for further distribution to the public; and
- e. providing information to the public concerning the test objectives and number of test programs in each version of the test suite, and other information that promotes a public awareness of the test suite and evaluation criteria.

3.4 Ada Validation Facilities (AVFs)

An AVF is chartered by the AJPO to conduct validation by:

- a. adhering to validation procedures approved by the AJPO;
- b. producing the VSR;
- c. forwarding unresolved test issues to the AVO for review and analysis, with final resolution to be provided by the AJPO, if necessary;
- d. providing advice on a customer's registration request for a derived Ada implementation; and
- e. striving to satisfy national accreditation criteria.

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The **AJPO** may issue an **AVF** charter to an organization that has been recognized as an accredited testing laboratory by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST). The **AJPO** may issue a charter to an organization located in a country which has a Memorandum of Understanding (MoU) with the U.S. government covering the chartering of **AVFs**, according to the rules specified in the MoU. An **AVF** charter may remain in effect indefinitely; however, a charter can be revoked by the **AJPO**, at any time, for due cause. The **AJPO** may direct an impartial body to conduct an audit at any time or prior to issuing an **AVF** charter. Audits are conducted in accordance with procedures established by the **AJPO** at the time of the audit and are tailored to reflect the purpose of the audit.

3.5 ACVC Reviewers

The **ACVC Reviewers** is the group chartered by the **AJPO** to address quality and configuration management issues by:

- a. assisting in refining overall testing philosophy and priorities for test coverage;
- b. providing expert technical review of the test objectives and tests during their development;
- c. ensuring that advances in the interpretation of the **Ada Programming Language** are reflected appropriately in the test objectives;
- d. providing liaison between the **certification system** and the ISO Working Group for the Ada Standard (i.e. ISO-IEC/JTC1/SC22/WG9).
- e. reviewing and acting upon comments received from compiler vendors and other interested parties.

Accordingly, the **ACVC Reviewers** cooperate closely with the **AVO** and the **AMO**. In particular, the **ACVC Reviewers** monitor the resolution of test program disputes (see Section 5.2.3).

3.6 Fast-Reaction Team (FRT)

The **Fast-Reaction Team** is a small group of Ada language experts who advise the **AVO** on complex test issues by:

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- a. assisting the AVO to issue a decision to the customer and AVF in a timely manner; and,
- b. contributing to ISO Working Group 9 language issue resolution.

3.7 Customers

Customers are serviced by the Ada certification body in matters concerning Ada validation. In requesting services of the Ada certification body, customers are to provide accurate and complete information to perform validation, to register derived Ada implementations, or to obtain other services.

3.8 Project Manager

Project managers are responsible for the acquisition of an Ada compiler that is validated according to the procedures set forth in this document. The Ada compiler selected for software development or for maintenance of existing software should be baselined as a project configuration item which will be controlled by the project configuration management process. A project manager should also obtain a copy of the ACVC used to validate the project compiler so as to periodically test it if customizing changes have been made. The project manager may perform the ACVC testing or obtain these services from an AVF. With good management practices, a project manager plays an important role in preventing the proliferation of dialects of the Ada programming language.

4. THE ADA COMPILER VALIDATION CAPABILITY

The ACVC is designed to demonstrate the conformity of an Ada implementation with the standard. The ACVC is distributed as a collection of test programs, support programs which facilitate processing the tests, and an ACVC User's Guide that explains the criteria for evaluating the results.

With Ada 9X there will be a shift toward tests for expected usage of the language. Tests that reflect fringes of the language in terms of usage, or that reflect pathological, remote occurrences will be removed. This will permit the elimination of some existing test programs so that coverage of additional features can be achieved while maintaining, or even reducing, the size of the ACVC. The objective is to place strict limits on the size of all future versions of the ACVC.

4.1 Versions

A new ACVC version is released periodically according to a schedule which is determined by the AJPO. Each new version incorporates changes to the ACVC as determined necessary by the AJPO. These changes are made in order to reflect a revision of the standard, to incorporate ISO WG9 interpretations, and to address implementer or user comments. The test objectives for each new ACVC version will be available for public review and comment before test programs have been implemented. Comments on test objectives should be submitted to the ACVC Reviewers who will recommend action to the AJPO after consultation with the ACVC Team, AMO, and the AVO.

The final ACVC for Ada 83 is version 1.11. This version will be used for validation testing until after the Ada 9X ACVC is available. The expiration date for ACVC 1.11 will be announced well in advance by the AJPO. Each new ACVC version will be available to the public and AVF customers at least six months in advance of the date when it will be used in validation.

4.2 Applicability of ACVC Test Programs

Each ACVC test program has one or more test objectives which are described in a comment in the test program. Some test objectives might address language features that are not required to be supported by every Ada implementation (e.g., "check floating-point oper-

ations for digits 18"). These test programs generally contain an explicit indication of their applicability and the expected behavior of Ada implementations for which they do not apply. The determination of applicability is made according to the grading criteria in the ACVC or as a ruling by the AVO. All applicable test programs must be processed and passed according to the specified grading criteria.

4.3 Test Modifications

The certification body strives to apply the ACVC as uniformly as practical to all Ada implementations. In order to apply common test objectives that depend on implementation dependent characteristics (e.g., line lengths and numeric types), many test programs must be adjusted to a given implementation following the procedures given in the ACVC User's Guide. These adjustments consist of the insertion of implementation dependent values in certain test programs at places prescribed by the ACVC.

In addition to the anticipated test modifications, other changes may be required in order to remove conflicts between a test program and implementation dependent characteristics (e.g., the algorithm for recovering from syntax errors). The allowable changes for each Ada implementation are determined by an AVF after consultation with the AVO, except in the case of error-recovery problems which an AVF may address without consultation.

4.4 Test Withdrawal

In any ACVC version, it is possible that a test program is based on assumptions which need not hold true for all Ada implementations or that a test program does not meet its objective. In these cases, the AVO may issue a correction to the evaluation criteria in the ACVC User's Guide or the test program may be withdrawn from that version of the test suite. Any interested party may challenge a test program by sending a rationale for the challenge to the Ada Rapporteur Group (see appendix G for the address). The AVO will withdraw a test program from the current version of the test suite when the Ada Rapporteur Group has accepted the challenged test for extended resolution. When an AVF customer is preparing for validation, the customer must challenge a test program only through an AVF by asking for a review of its evaluation criteria or for its withdrawal. The form for submitting a challenge is provided in Appendix B.

4.5 Customization

A customized test suite is produced by the AVF for each Ada implementation that is a candidate for validation. This customization always consists of removing withdrawn tests and in making required modifications to test and support programs; and, it may include removal of some inapplicable tests, when detailed rules for them are provided in the ACVC User's Guide.

4.6 Passing the ACVC

An Ada implementation passes a given ACVC version if it processes each test of the customized test suite in accordance with grading criteria, whether the test is applicable or inapplicable: otherwise, the Ada implementation fails the ACVC.

4.7 Availability

The ACVC is available to the general public from the NTIS according to U.S. Department of Commerce policies and rules for payment of fees and for export control. The ACVC is also available to a customer of an AVF from that AVF. It should be noted that the distribution of the ACVC may be subject to the nominal export restrictions as detailed by laws of the U.S. and other countries.

5. VALIDATION BY TESTING

There are six steps which must be completed by a customer and the certification body so that the customer obtains a validation certificate and a VSR. The same ACVC version must be used to complete the steps described in this section. The ACVC version used for validation testing must be the current one: there is no exception to this rule. The AVF must be able to begin validation testing the Ada implementation at the customers site before the current ACVC version expires or else validation with that ACVC version will not be allowed. Anyone intending to obtain a validation certificate should contact an AVF without delay for advice on the handling of the ACVC, on interpretation of the test grading criteria, and on the operational details of that AVF's management practices.

5.1 Step One: Validation Agreement

In order to obtain services from the certification body, an interested party must become a customer of an AVF by reaching a formal agreement. This agreement should address the following topics:

- a. identification of the Ada implementation to be tested and the ACVC version to be used;
- b. a statement of work, including analysis of prevalidation testing, validation, and preparation of the VSR;
- c. the format of data to be exchanged;
- d. a schedule of events and the site of validation;
- e. financial arrangements;
- f. retention of records;
- g. AVF liability; and
- h. confidentiality of validation information.

The schedule for events, deliverables, and payments should take into account the fact that certain steps in the validation process require interaction with other members of the certification body (i.e., AVO or AJPO). The AVF will put forth its best effort to keep confidential a customer's intent to obtain a validation certificate and the projected schedule for validation. This confidentiality will not be allowed to interfere with the normal review procedures of validation. If the customer requests confidentiality for reasons of national

security, the customer will provide to the AVF an official statement of the security level that applies to the validation, and the AVF will obtain further guidance from the AJPO.

5.2 Step Two: Prevalidation

The requirements of this step are discussed separately so that the customer understands the interaction that is required with an AVF.

5.2.1 Customer Testing

After entering into a formal agreement, the customer provides the necessary information for the AVF to prepare a customized test suite or, the customer may prepare a customized test suite according to instructions in the ACVC user's guide. The customer then processes all the tests in this customized test suite using the candidate Ada implementation or another Ada implementation which produces the same result. If the implementation provides for options in the way programs are processed, then the same set of options must be chosen for all test programs, with the possible exception of an option controlling the production of information output. Any other exception constitutes a test issue which must be resolved with the AVF (see Section 5.2.3). Test issues should be sent to the AVF for analysis as soon as they are known.

5.2.2 Submission of Results

Upon completion of testing, the customer delivers the complete set of results in the agreed format to the AVF. These results are accompanied by the following information:

- a. a list of test programs which the customer claims are inapplicable, together with an explanation for these claims;
- b. a list of test programs which are disputed but not withdrawn (see Section 4.4) together with explanations (see Appendix B for format);
- c. an annotated sample command script;
- d. the complete set of option settings used for processing the customized test suite, including the default settings; and

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- e. complete and current documentation for implementation dependent characteristics as required in the VSR.

5.2.3 Test Issues

A test issue may be any of the following:

- a. a missing or incomplete result to a test;
- b. a result presented in an inadequate form;
- c. a disagreement between the customer and the AVF as to the interpretation of a result;
- d. a change in the choice of options to be used during testing;
- e. a result which makes the Ada implementation fail the ACVC according to the current grading criteria; or
- f. an implementation dependent characteristic that may affect the conformity of the Ada implementation.

The material submitted by the customer is analyzed by the AVF and test issues resolved. If the AVF and the customer cannot agree on a way to resolve a test issue, the issue will be referred to the AVO for a resolution (see Section 5.2.4). It may be justified to leave a test issue unresolved at prevalidation. For example, it may be impossible to check the processing of control characters by inspecting printed results. The AVF will note these unresolved issues and describe the results which will be expected during validation testing. It is also possible that the customer information provided for production of the customized test suite (see Section 5.2.1) was insufficient so that corrections to the customized test suite must be made and additional processing will be required.

5.2.4 Test Issue Resolution

A customer may challenge the applicability or correctness of any particular ACVC test program. Such challenges should be presented to the AVF in the test-dispute format (see Appendix B). The AVF will forward challenges to the AVO for resolution; the AVO will strive to rule on the challenge within two weeks of receiving it. The AVO will forward all challenges and rulings to the ACVC Reviewers, AMO and the ACVC Team. (See Appendix C for a description of the Test Dispute and Resolution Process.)

5.2.5 Incomplete Prevalidations

The AVF and the customer may agree that, at the customer's risk, parts of the **customized test suite** need not be processed. The customer must certify that the results from a previous prevalidation submitted to the AVF or **validation** results obtained by the AVF are identical to those that would have been obtained by the customer. The normal practice is to submit complete prevalidation results.

5.2.6 Successful Prevalidation

Prevalidation testing is successful if the analysis of results and the resolution of **test issues** show that the candidate **Ada implementation** passes the **customized test suite**. Prevalidation is successful with caveats if the results are satisfactory except that they were incomplete or if resolution of some **test issues** are deferred until **validation** testing by agreement between the AVF and the customer.

5.3 Step Three: Validation Testing

Upon successful completion of prevalidation, with or without caveats, the AVF witnesses testing of the **Ada implementation** at the site and time mutually agreed by the AVF and customer. The AVF prepares a **customized test suite** based upon customer information and any information collected during the resolution of **test issues**. The **customized test suite** is installed and processed under AVF supervision. If the AVF determines that the results agree with those obtained from prevalidation and are satisfactory with respect to the caveats, the testing has been successful; otherwise, re-testing will be required, unless the validation attempt is discontinued. (See Section 5.7 for Provisional Validation.)

5.4 Step Four: Declaration of Conformance

At some time during the **validation** but not later than at **validation testing**, the customer will complete and sign a **declaration of conformance**. The declaration states that the organization which is responsible for the production, maintenance or distribution of the **Ada compiler** is offering a product that is in **compliance** with the **Ada programming language**. The declaration becomes part of the AVF records and is copied into the VSR. A Val-

validation Certificate will not be issued unless a signed declaration of conformance has been provided to the AVO.

5.5 Step Five: Validation Summary Report

A VSR is produced for each validation testing effort. A single VSR may cover validation testing of several Ada implementations, provided that they all have the same result profile. The VSR provides the following documentation pertaining to the validation effort:

- a. identification of the customer responsible for validation of the Ada implementation;
- b. identification of the organization responsible for the production, maintenance, or distribution of the Ada compiler or Ada implementation;
- c. identification of the Ada implementation tested;
- d. options provided by the Ada compiler and identity of the options used for testing;
- e. the inapplicable test programs and implementation dependent characteristics exhibited by the test programs that established inapplicability;
- f. the implementation dependent characteristics pertinent to the customized test suite;
- g. description of implementation dependent characteristics as detailed by "Appendix F" of [Ada 83 and its successor];
- h. withdrawn test programs;
- i. modifications to test programs with an explanation for such modifications; and
- j. a description of failed test programs, if applicable. (See Provisional Validation, Section 5.7.)

5.5.1 VSR Production

The VSR is prepared by the AVF but includes material which is produced by the customer, such as the "Appendix F" required by [ANSI 83 and its successor]. A draft of the VSR is sent to the AVO for approval before or after validation testing. The final version of the VSR is signed by the AVF, the AVO, and the AJPO.

5.5.2 VSR Availability

The final version of the VSR is available to the general public from NTIS and from the AVF that produced it. The AVF may require payment of a fee for VSR reproduction and mailing costs.

5.6 Step Six: Validation Certificate

For each successful validation, one certificate is issued by authority of the AJPO. An example of a certificate is provided in Appendix C. The information on the **validation certificate** describes the tested **Ada implementation**: the source of this information is the signed **declaration of conformance** which the AVF provides to the AVO after completion of testing. The customer will ensure that the information contained on the certificate does not infringe on the rights of third parties and may be required to provide a written statement of consent from any third party involved. **Validation certificates** will expire one year after the expiration date of the ACVC version used for the validation. An entry in the list of **Ada implementations** validated by testing will be made for each certificate issued. This entry will be removed when the certificate expires.

5.7 Provisional Validation

When **prevalidation testing** has been unsuccessful, a customer may petition the AVO to continue with **validation** by identifying up to ten ACVC test program failures to dispute on non-technical grounds. The AVO will present the dispute to the FRT as a petition for **validation** with test failures. Unless the dispute is denied by the FRT, the AVO will rule that the test program(s) will be processed during **validation testing** and the compiler behavior will be documented in the VSR. A **Provisional Validation Certificate (PVC)** that lists the failed tests will be issued by the AJPO. A PVC will expire 12 months after the date validation testing was completed. The customer will arrange with the AVF to witness the result of error correction in the **base implementation**. The customer may appeal to the extended resolution process (see Section 4.4) but the appeal must be accepted and the test program withdrawn from the ACVC before AVF re-testing. If the compiler passes the previously failed tests, a VC will be issued and the VSR will be revised. The list of PVCs will be maintained by the AJPO for the public. VSRs for validation with failed tests will be reviewed by the AVO and will be publicly available from the AVF, AVO and AJPO.

The AVO may deny repeated petitions from the same customer for provisional validation of an Ada implementation.

5.8 Advertising Validated Status

The customer will not advertise or make public claims that the Ada implementation is validated until after receiving a validation certificate or after receiving formal notification from the AVF that the AJPO has issued a validation certificate. A waiver of confidentiality must be signed by a customer who intends to advertise the completion of events that indicate progress toward completion of validation. If a waiver of confidentiality has been signed with the AVF, the AVF will respond to inquiries about the customer's advertisements or public claims by acknowledging receipt of validation materials (i.e., a formal agreement, pre-validation results, or validation testing results) without judgement concerning the success of the validation.

5.9 Certification Mark

The certification mark (see Appendix E for reproduction) may only be used on products directly associated with validated Ada compilers, such as disks, tapes, packaging, advertising, reference manuals and any other associated documentation where a significant portion relates to a validated Ada compiler. This unique mark distinguishes compilers validated in accordance with the rules in this document. The certification mark can be reproduced in any size, color, or combination of colors.

5.10 Ada 9X Transition Period

Procedures in this document will be used during the transition to Ada 9X. Minor modifications in procedures may be required to reflect differences between the Ada 83 ACVC and the Ada 9X ACVC. The life of ACVC 1.11 validation certificates and registrations has been extended to be compatible with ANSI adoption of Ada 9X. The Ada 9X Transition Plan [Ada 9X] and Ada 9X public reports provide current transition information.

6. VALIDATION BY REGISTRATION

6.1 Result Profile

Two Ada implementations which pass a given ACVC version have the same result profile when:

- a. they use the same customized test suite;
- b. inapplicable test programs in the customized test suite are the same for both implementations;
- c. inapplicable test programs are inapplicable for the same reasons; and
- d. any implementation dependent characteristics tested for by the customized test suite are the same for both implementations.

6.2 Derived Implementations

An Ada implementation may obtain validated status by registration when all of the following conditions are true:

- a. The Ada compiler was obtained from the Ada compiler of the base implementation by changes that are within the scope of accepted software maintenance practices.
- b. The target machine of the base and derived Ada implementation have compatible instruction sets and operating system or kernel.
- c. The Ada compiler has been tested with the customized test suite that was used to validate the base implementation.
- d. The result profile for the Ada implementation is either the same as the base implementation or, if there are differences, these differences are justified as being within the scope of accepted software maintenance practices. (see Section 6.3).

Common examples of compatible instruction sets and operating systems are two different computer system models in a manufacturer's product line or the computer systems produced by different manufacturers that use the same instruction set and operating sys-

tems, or any computer system and a simulated or emulated computer system that are the same instruction set.

The changes that may be made to an Ada compiler for the purpose of derivation will be within the scope of software maintenance as applied to the domain of compiler construction. Changes must be classified as **corrective**, **adaptive**, or **perfective**. Examples of these changes are the correction of a compiler error, the adaption to an **operating system** upgrade, the transfer of the compiler to another **host machine**, the addition of a floating point processor to a small **target machine**, or the perfection of a garbage collection algorithm. For the purposes of obtaining validated status by registration, the changes required to render the base Ada compiler fully functional on a different **host machine** or **host operating system** is considered **adaptive maintenance**.

6.3 Registration Request

Any interested party may initiate a registration by sending a request to the AVO or to an AVF. An AVF may establish a fee for advisory service, or may refuse to provide advice if it did not validate the **base implementation**. The registration request must be signed and provide the following:

- a. reference to the **validation certificate** for the **base implementation**;
- b. identifying description of the Ada implementation(s) being derived from the **base implementation**;
- c. a **declaration of conformance** for the **derived implementation(s)**;
- d. a consent agreement from any other party having a legal interest in the Ada compiler;
- e. a listing of the Ada implementation(s) that were tested with the **customized test suite** used in the **validation** of the **base implementation**; and
- f. appropriate evidence that the Ada implementation(s) may, in fact, be derived from the referenced **base implementation**.

Note that the identifying description required by b. must include the nomenclature of the **computer system(s)**, including **operating system** for both **host** and **target machines**, or **kernel** for the **target machine**, if applicable, the **Ada compiler name** and **version identifier**, and identifier for any components of the **host** and **target machines** listed in the **VSR** for the **base implementation**. The statement, required by f., will include the classification

of software maintenance changes (see Section 6.2) and the effect these changes have on the result profile; will list the differences between the computer systems of the base implementation and the derived implementation; and will describe the effect these differences have on the Ada compiler. The information required by e. and f. substantiate the claim made in the declaration of conformance. (See Appendix D for the proper form for a Registration Request.)

6.4 Evaluation

The AVF will not perform testing on derived implementations. Any AVF may review the registration request for completeness and the plausibility of information and provide advice. The AVO will evaluate all registration requests before recommending that the derived implementation(s) be added to the list of validated Ada implementations maintained by the AJPO.

6.5 Registration

Registration requests which are acceptable to the AVO will be registered as validated Ada implementations untested by an AVF. A validation certificate will not be issued for these derived implementations but the customer may use the certification mark awarded to the base implementation. The list of derived implementations and information provided in the registration request will be available to the public.

6.6 Expiration of Validated Status

A derived implementation loses its status of being validated if it is challenged successfully (see Section 6.7), upon expiration of the validation certificate of its base implementation, or when registration is revoked by the customer.

6.7 Challenges

Any derived implementation may be challenged by any interested party through an AVF. The challenger will pay a challenge fee to the AVF and will submit a challenge request which:

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- a. identifies the **derived implementation** being challenged;
- b. names one ACVC test from the **customized test suite** together with its **implementation dependent parameters**, if any; and
- c. describes in which way the **implementation** will fail this test.

The AVF will send this challenge to the originator of the registration asking for comment. The challenge will be considered settled if the registration is revoked by the registration originator, otherwise, the challenge will be settled as outlined in Section 6.9.

6.8 Challenge Mark

The AVF will inform the AVO that a challenge for a given **derived implementation** has been received. The **derived implementation** will then be marked as "challenged" on the list of **derived implementations** maintained by the AJPO. Information pertaining to the challenge may be requested by any interested party and received from the AVF. It should be noted that a challenge mark applies only to the **derived implementation** which was named and does not indicate any judgement about the **conformity** of the challenged implementation.

6.9 Challenge Test

The AVF will conclude a formal agreement with the challenger which covers the AVF's cost for performing a challenge test. For challenge testing, the **challenged derived implementation** will be tested against the named ACVC test. The challenger will provide access to the **challenged derived implementation** and appropriate expertise to facilitate the AVF test. The AVO will be informed of the test result. Depending on its result, the AVO will settle the challenge by either removing the challenge mark or the **derived implementation** from the list of **validated Ada compilers**.

Appendix A. Declaration of Conformance

Customer: _____
Certificate Awardee: _____
Ada Validation Facility: _____
ACVC Version: _____

Ada Implementation
Ada Compiler Name and Version: _____
Host Computer System: _____
Target Computer System: _____

Declaration:

I the undersigned, declare that I have no knowledge of deliberate deviations from the Ada Language Standard ANSI/MIL-STD-1815A, ISO 8652-1987, FIPS 119 as tested in this validation and documented in the Validation Summary Report.

Customer Signature
Company
Title

Date

Certificate Awardee Signature
Company
Title

Date

Note: If the Customer and the Certificate Awardee are the same, only the customer signature is needed.

APPENDIX B

Implementer Dispute Format

[part A]

Implementer:	<implementer's name>
Configuration:	<host & target hardware & operating systems>
ACVC Version:	<ACVC version#>
Pre-Validation Submittal Date:	<due date for in-house results>

[Part A will be completed once by each implementer; part B will be completed for each dispute. It is not necessary for a pre-validation date to have been established. Part A information is treated as confidential.]

[part B]

Reference: <test name {,test name}>
Summary: <brief description of the dispute>
Discussion: <detailed description of the dispute>

[In this Discussion, arguments should be specified using test line #s and references to pertinent sections of the Ada standard, Commentaries (AI-xxxx), or the ACVC Implementer's Guide (AIG)*. The implementer must describe the behavior of the implementation for the test or tests that are disputed, stating the particular test messages that are produced. It is sufficient for the detailed description to be limited to the particular segment of test code that is disputed. Relevant source code with compiler messages should be included. (For a group of tests that cause much the same behavior, it is sufficient for a detailed description to be given for one of them, with the relevant line numbers given for the like problems in the related tests.)

If the argument depends upon implementation constraints of hardware or software (e.g., characteristics of the operating system), then these should be specified; the particular computer and operating system should be identified. It is especially important that implementations that fail to pass some test due to capacity limitations be described in enough detail for the AVO to assess the reasonableness of these limitations.

Failure to fully specify the points pertinent to a dispute might result in an adverse decision being made, with the disputer having to further argue the case with a second submittal to the AVO. Yet it is possible that the Summary will suffice to adequately present a dispute.

*. (The AIG is not an official interpretation of the Ada standard but it might provide useful information in support of a dispute in explaining implementation choices.)

APPENDIX C

TEST DISPUTE AND RESOLUTION PROCESS

C-1. Introduction

A "dispute" is defined by the ACVC User's Guide as any result from processing an ACVC test program that is not a passed or inapplicable result according to the established grading criteria. This intentionally broad definition of a "dispute" is to make certain that compiler implementers bring all deviant test results to the attention of the AVF, without assuming that such results would be accepted without special review. The compiler implementer also provides a rationale for each challenge being made to a particular test program. Disputes are forwarded to the AVO, usually electronically, by the AVF on behalf of their validation customer. For each dispute that is accepted (i.e., when the AVO rules in favor of the dispute), it is likely that some correction is indicated for the disputed tests. The AVO withdraws any test that is found to be incorrect to a degree that makes it unsuitable for validation. The withdrawal of a test consists of including it on a list of tests that are ignored for validations conducted with the current ACVC version. The AVO updates the list of withdrawn tests, and distributes this list to the AVFs, the AMO, ACVC Reviewers, and ACVC Team. The AVO also maintains a database consisting of all test disputes and their resolution (AVO rulings) which is periodically provided to the ACVC Reviewers, AMO, ACVC Team, and the FRT. The AVO may also recommend that certain resolved disputes be considered further by the ARG/URG, even though the Chairman of both the ARG and URG currently participate in deliberations of the FRT.

C-2. Expedited Resolution Process

The AVO resolves disputes by any of three methods: a resolution that was made previously is applied to the current dispute (e.g., the same dispute might be submitted at different times by different petitioners); the resolution can be determined unequivocally based on the

Ada standard or Ada Commentaries; or, the resolution is determined based on the deliberations of the FRT. Although the Ada Compiler Validation Procedures do not set a limit on the length of time for reaching a resolution, the AVO attempts to resolve disputes within two weeks, an informal guideline that was established by the certification body. The AVO also attempts to place priority on resolving disputes for AVF customers who have a firmly scheduled date for validation testing. Implementers should submit disputes well in advance of a scheduled validation testing date. (see Section 5)

On receipt of a dispute, the AVO checks whether the issue matches any that had been previously resolved. If the dispute is new, it is given an initial AVO analysis which involves research using the Ada Commentaries in conjunction with the Ada standard and references to previous dispute deliberations. A dispute is referred to the FRT when questions of interpretation arise and a resolution is not obvious. The AVO presents the dispute and any additional information resulting from an initial analysis to the FRT by e-mail without disclosing the identity of the petitioner. Deliberation of the dispute proceeds with the exchange of each expert's opinion and analysis. The AVO participates in the deliberation by providing information as requested (e.g., ACVC tests or information from the petitioner), eliciting discussion from the experts, and making or challenging technical points raised in the discussion. In general, where an issue receives support from some members of the FRT, the dispute is accepted.

There is no prescribed formality to the FRT deliberations, such as voting procedures or time limits on deliberation. The AVO might extend deliberation when a basis for resolving the dispute has not been made. However, the AVO will give its ruling on the dispute when a sufficient basis has been established, regardless of whether the FRT discussion continues.

C-3. Types of Resolutions

The resolution of a dispute is either an acceptance or rejection of the petitioner's arguments. Acceptance can result in either withdrawal of the test program from the ACVC or in a "Test, Processing, or Evaluation" modification for validation. A dispute may be rejected if it conflicts with the Ada standard or Ada Commentaries or if it is a test to which previously validated implementations conform and the petitioner has not provided compelling reasons for a deviation. A dispute may lead to the withdrawal of a test program if the test is shown to be incorrect to a degree that wrongly influences implementation. Withdrawn tests have no effect on validation (they are generally not processed). If the dispute shows

the affected test program(s) to be incorrect in only a minor, limited degree, generally the AVO will direct that the test(s) be processed with a test modification.

There are three types of test modification: Test, Processing, and Evaluation modifications. A Test Modification is an actual change to the code of the test (e.g., adding a choice to an exception handler). A Processing Modification is a change to the way in which the test is processed (e.g., re-ordering the compilation of component files of a multi-compilation test). And an Evaluation Modification is simply the grading of the observed results by other than the established grading criteria (e.g., interpreting particular intermediate output and a final "failed" result as "passed", according to an understanding of the dispute). All test modifications are documented in the VSR.

C-4. Example of Extended Resolution

The major issue to arise during fiscal year 1991 was the vulnerability of many tests to optimization that removes assignments to unused variables. Many of the tests that check that an exception is raised under prescribed conditions use code that does not prohibit the exception-raising expression from being eliminated. The Ada standard (11.6:7) permits an operation to be eliminated "if its only possible effect is to propagate a[n] exception". In many of the tests this is precisely the case, as the expression returns a value that is intended to be assigned to a variable that is never used (hence, the value is not needed and the assignment and expression evaluation need not be made). The AVO rejected only one case of optimization, where it removed a programming safeguard (local variable initialization for a block) and was too far from what the standard clearly permits. This issue has been referred to the ACVC Team and the ACVC Reviewers for consideration during the development of the Ada 9X ACVC and the Ada Rapporteur Group.

C-5. Summary

There is no limit on the number of disputed tests that can be submitted by an implementer. Although there is a risk that a dispute will not be decided in the implementer's favor, that risk can be managed so as to not affect validation by early submission of disputes. The validity of grading criteria for ACVC tests has been very important for Ada 83, and will take on even greater importance for Ada 9X usage based tests. Any interested party may dispute an ACVC test and its grading criteria. Disputes that lead to the removal of unusual test cas-

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es (informally called pathological tests) from the last version of the Ada 83 ACVC will be helpful in making a transition to the Ada 9X usage based test coverage. Future modifications to procedural rules for test disputes will be consistent with the Ada 9X ACVC.

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APPENDIX D

REGISTRATION REQUEST

A registration request must have two main parts: (1) a letter and (2) an enclosure consisting of specific information to support the request.

PART 1 - LETTER

The request letter should be addressed to the Ada Validation Organization (AVO) (note: see Appendix G for address) even though the requester does seek advice from an AVF. The mandatory parts of the letter are:

1. Certificate number and description of the Base Implementation,
2. List of derived implementations that were fully tested with the customized ACVC used in the base validation. *If this list is less than the list for which registration is requested, item 4 must also be included in this letter.*
3. We declare that we have no knowledge of deliberate deviations from the Ada Language Standard [ANSI/MIL_STD-1815A/ISO 8652-1987/FIPS119] in the implementation.
4. For the derived implementations that were not fully tested, we declare that, to the best of our knowledge, these implementations will pass the customized ACVC used in the base validation. Any possibly observed deviations are the consequence of implementation errors.
5. If this statement applies, legal interests of (name) are affected by this registration request and their consent is documented in enclosure (number) to this letter.
6. The Ada implementations for which registration is requested may, in fact, be derived according to the rules given in the Ada Validation Procedures, Version 3.1 as explained in enclosure (number).
7. Signature
8. Corporate Title

PART 2 - TEMPLATE FOR SUPPORTING INFORMATION

1. Identification of Base Ada Implementation:

- a. Certificate number: _____

2. Registration requested for:

Note: This registration request pertains to all Ada implementations obtained by taking the Ada compiler and selecting any host and any target from the list below.

Compiler: [name and version(s)/release number/product(s) range of versions/releases]

Host: choose either (a) or (b)

- a. [make, specific members of series and/or model numbers] (e.g. *IBM PS2 model 80-110 & 113*) or,
- b. [all members of a model series] (e.g. *IBM PS2 all models, or HP 9000 series 300*)

Operating System: [name and version/release number(s)]

Target: *choose (a), (b), or (c)*

- a. [make, specific members of series and/or model numbers] or
- b. [all members of a model series] or
- c. [members of an instruction set architecture and board implementation(s)] (e.g. *Motorola 68020-MVME133-1 & MVME130COF, Motorola 68030-MVME147, Motorola 68030-MilSpec285*)

Operating System: *choose either (a) or (b) or (c)*

- a. [OS name and version/release number for all target machines listed] or
- b. [kernel identifier for all target machines listed] or
- c. [none for all target machines listed]

3. Evidence that the Ada implementations listed above should be validated by registration:

- a. State the type of software maintenance changes made to the compiler and describe what was done.
 - corrective - maintenance performed specifically to overcome an existing fault.

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- perfective - maintenance performed to improve performance or maintainability.
- adaptive - maintenance performed to make a software product usable in a changed environment.

b. Which host/target combinations were fully tested with the ACVC?

Testing with "customer applications" or other types of tests is not equivalent to running the ACVC. If a sub-set of ACVC tests were run, so state and indicate the sub-set.

- c. State whether the result profile is the same or different from the base. If different, list all ACVC test results that are different or exhibit different behavior and explain the difference.
- d. What is the authoritative source used to determine the technical compatibility between the derived implementations and the base?

If copies of technical manuals are supplied as the source of this information, give the enclosure number where this information can be found. Do not duplicate a previous submission of identical technical material, just reference its previous submission. If there has been a change in the previously submitted material, submit only the change. If there is no authoritative source of information given, this registration request may be refused.

APPENDIX E

Certification Mark



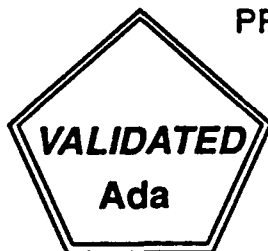
THIS PRODUCT CONFORMS TO
ANSI/MIL-STD-1815A AS
DETERMINED BY THE AJPO
UNDER ITS CURRENT TESTING
PROCEDURES



THIS PRODUCT CONFORMS TO
ANSI/MIL-STD-1815A AS
DETERMINED BY THE AJPO UNDER
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APPENDIX F

PROJECT GUIDELINES

F-1. BACKGROUND

The general validation procedures given in the preceding sections of this document describe the process of establishing the conformity of an Ada implementation before it is offered for sale in the market place. In the U.S., Federal Information Resources Management Regulations [FIRMRS] require that a compiler must have validated status when it becomes part of the Federal Government's software inventory. The FIRMRS also require that application software supplied to the Federal Government will be the product of a validated compiler. In other countries, there may be established government or commercial requirements that are similar to the FIRMRS in intent. Since validated status is limited to the life of a particular validation certificate, suppliers of compilers or software must periodically complete the steps in the validation process so as to have a current validation certificate for Ada implementations. However, there are practical project-level difficulties associated with maintaining an always current validated status for all compilers being used to develop or maintain software. This section provides guidelines for project managers that are consistent with the goal of preventing the proliferation of dialects of the Ada programming language. These guidelines should be tailored by organizations that manage software projects according to their quality assurance policies and configuration management procedures. These guidelines are normative for the U.S. DoD and optional for others.

F-1.1 Acquisition Requirements

A project manager will identify the requirement for a validated Ada compiler as an action within the context of project milestones. This requirement will be met when a validated Ada implementation has been delivered for the project. If the Ada implementation

selected for the project is not validated, the project manager is responsible for requesting that validated status will be obtained in accordance with the general rules of procedure for validation by testing or registration as early as possible in the software development process.

F-1.2 Baselined Project Compiler

The project manager should determine whether the Ada compiler(s) used on the project will be upgraded or replaced by the supplier on a validation schedule which is independent of project milestones; or, whether the validation certificate will be allowed to expire before these milestones are reached. The project manager will baseline the validated compiler and the ACVC at a given version when it is more cost-effective for the project to forego replacements of the compiler with later validated versions. If the compiler being used on the project does not have validated status (e.g., the version was derived but not registered by the vendor), it must have validated status, by testing or registration, to qualify as a project compiler. When the validated compiler has been baselined, it then becomes a project compiler for the lifetime of that project, or until the project manager establishes a requirement for validation prior to reaching a particular project milestone. When a validated Ada compiler has been baselined for a project, configuration management procedures must be established to ensure complete documentation of any derivations from it or any deviations from ACVC test results obtained previously from the baselined compiler.

F-1.3 Project Registration

The project manager should notify the AJPO when a validated Ada implementation has been selected for a particular project as a baselined version that will be used for an extended period or for the life of the project. Notification may take the form of the registration request generally used by compiler vendors with the addition of information that identifies the project. (See Appendix D for the registration request form and Section 6 for general rules.) Experience has shown that formalizing the declaration of a project compiler is useful for a project manager, as well as for the AJPO, when disputes arise concerning the validated status of compilers that have been used on a project.

F-1.4 Embedded Applications

Some software development projects include applications that execute on a target machine that is embedded in a larger system. A compiler used to generate object code for the embedded target machine is considered to be a validated project compiler only if all of the following conditions are satisfied:

- a. The project compiler was a validated Ada compiler or was derived from a validated Ada compiler.
- b. All mandatory features of the Ada programming language that can be supported, or are emulated on the embedded target machine, are supported by the compiler for the target. That is, compilers for the restricted target shall not be arbitrarily constrained to subset implementations of the Ada programming language.

During software development of embedded applications, project managers must ensure that all run-time systems used to generate code are managed as configuration items consisting of libraries and documentation for all versions that will be delivered for operational use. All limitations of the restricted target should be documented in Appendix F for the Ada implementation.

F-1.5 Re-testing

The project manager should ensure that the project compiler retains a known degree of compliance with the standard throughout the remaining life of the project by periodically re-testing the project compiler using the ACVC version used to originally establish the conformity of the base implementation or a derived implementation. The project manager should determine whether this testing will be done by project personnel or by an AVF, so as to obtain a VSR that will document the result of re-testing. The services of an AVF are desirable when project personnel are unfamiliar with the testing procedure and interpretation of test results. (A VC will not be issued for a project compiler unless it passes a current ACVC version and validation is conducted as described in Section 5.)

When a software release has been produced on several project compilers, ACVC re-testing requirements apply to each of these compilers. Records of compiler maintenance changes and the ACVC result profile will be maintained for each project compiler. These

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records will be current and available for inspection by the government. Examination of such records should be a routine action for audit teams.

F-1.6 Ada 9X TRANSITION

The last [Ada 83] ACVC version that can be baselined with a project compiler is ACVC version 1.11. Project managers who decide to baseline a validated Ada compiler for [Ada 83] must do so before expiration of the validation certificates issued for ACVC 1.11 validations. The first Ada 9X ACVC version that can be baselined with an Ada 9X project compiler is ACVC version 2.1.

APPENDIX G

Points of Contact

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Ada Information Clearinghouse (for the AJPO)

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Telephone: 703-685-1477

ACVC and VSR Distribution

National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Va. 22161
Telephone: 703-487-4650

DoD Public Affairs (press inquiries)

Ms. Jan Walker
OASDPA
Pentagon Room 2E765
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Validated Compiler Lists

AJPO - Official Ada lists, updated monthly.

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NIST - All FIPS validated compilers, updated quarterly.

**National Institute of Standards and Technology
National Computer and Telecommunications Laboratory
Gaithersburg, MD 20899**

APPENDIX H

References

[Ada 9X] Ada 9X Project Reports, Office of the Under Secretary of Defense for Acquisition, Washington, D.C. Available from the Ada 9X Project Office.

[ANSI 83] American National Standards Institute and United States Department of Defense: ANSI/MIL-STD-1815A Reference Manual for The Ada Programming Language, 1983 Note: This standard is identical with ISO/8652-1987 and FIPS 119, 1985. The ANSI 83 is available from various publishers and from the U. S. Government at the following addresses:

Commanding Officer
Naval Publications and Forms Center
Attn: NPODS
5801 Tabor Avenue
Philadelphia, Pennsylvania 19120

Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

The ISO/8652-1987 (French and English versions) is available from:

AFNOR
Tour Europe, cedex 7
F-92080 Paris la Defence
France

[ANSI/IEEE 90] American National Standards Institute and Institute of Electrical and Electronics Engineers, Inc., Standard 610.12-1990; "ANSI/IEEE Standard Glossary of Software Engineering Terminology".

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- [DoD 91] Department of Defense Instruction: Number 5000.2, January 1, 1991
Subject: Defense Acquisition Management Policies and Procedures
- [FIRMR 90] General Services Administration, Federal Information Resources Management Regulations (FIRMR) 201.20.303 and 201.39.1002, 28 December 1990, Subject: Federal Standards; and, Associated Federal ADP and Telecommunications Standards Index (updated semi-annually), Subject: Federal Information Processing Standards; Implementation, Validation and Conformance.
- [ISO 74] International Standards Organization: ISO 2382/I-1974 Data Processing - Vocabulary - Section 01: Fundamental Terms.
- [ISO/IEC 91] International Standards Organization: ISO/IEC, Guide 2, 6th edition 1991 - General Terms and Their Definitions Concerning Standardization and Related Activities.